APPARATUS AND METHOD FOR COMPUTER-ASSISTED DOCUMENT GENERATION

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Background of the Invention

The present invention relates to document generation systems and, more particularly to a system incorporating user-modifiable document templates or "boiler-plates", a database including information to be placed into "holes" within a particular document template, and a computing device which combines the particular document template with relevant information stored in the database to form a document.

Traditionally, the practice of dictating and transcribing has been used to record information related to interviews, personal reminders, thoughts on a subject, and drafts or letters of other documents. In the service industries, such as consulting, legal and medical fields, professionals have been increasingly burdened by the need to document every encounter with clients or patients. This

is particularly true in the medical field where physicians must record information about each patient office visit, diagnosis, suggested treatment and prescription given. In addition to recording patient information, physicians must

5   fill out forms for submission to insurance companies and provide information to regulatory agencies. To gather and produce all of this information, physicians must spend a significant portion of their work day dictating the needed information for each record or form. Further, a physician

10   must maintain a staff to transcribe the information into reports and to fill out required forms.

A physician typically dictates a report on each patient encounter which, subsequently, must be typed by a transcriber. The process is time consuming and repetitive.

15   For this reason, shortcuts are often taken causing reports to be incomplete. As a result, potential legal and insurance problems as well as reduced quality of patient care can occur. Using traditional manual methods of record keeping, patient data is not readily available for fast and

20   easy review. A patient's medical record cannot be easily combined with other reports or other patient data for analysis and reporting.

In response to the above-mentioned needs and problems encountered in the medical field, the present

25   invention was developed. The present invention automates the documentation process by providing a computer-based

documentation system incorporating a relational database with a multi-document word processor, preferably within a menu-driven, graphic window environment. The documentation system utilizes previously defined document templates or

5 "boiler-plates" to manage patient reporting and includes a user interface for use in selecting phrases to be inserted in the template. Preferably, the system will further comprise a graphics engine for display of graphical expressions of selection analysis.

10 For instance, an initial exam conducted by an orthopedic surgeon will contain many basic elements common to all patients, but response to the exam will vary for each patient. A report to be input can contain any number of variable responses, and each variable within the input

15 report can offer any number of different options from which to choose. In addition, a physician can personalize the report, modifying or creating new documents to suit a particular situation. Further, while generating a particular document, a physician can customize the document

20 by inserting words into the generated document through the use of the integrated word processor.

In an alternative embodiment, the physician can avoid directly using the documenting system by utilizing printed checklists. After a checklist has been filled out

25 by a physician, another individual can generate the desired documents from items checked off on the checklist.

The data input into the documenting system is electronically stored for possible future use in reporting and/or analysis. The future uses may include graphical analysis via the graphics engine, cost accounting, time

5 reporting and other desired document generation.

It will be appreciated by those familiar with the art that such a document generation system can be utilized in a plurality of environments including medical, legal, government, insurance and other service or document

10 generating environments. In the legal field, simple contracts, licenses or agreements could be drafted in this manner. In the government, routine status reports, procurement requests or inspection reports could be produced by such a system. In the insurance field,

15 insurance applications could be processed, policies maintained, or claim reports prepared. These and other possible areas of use of the present invention will become apparent after reading the following detailed description.

20 ### Summary of the Invention

A document generation system is provided for enhancing or replacing the dictation and transcription process. More particularly, a computer-based documentation system is provided which processes document templates in

25 conjunction with pre-defined character strings to generate user-defined reports or documents. Each document template

is composed of "boiler plate" text and "holes". A system and method are described for controlling, via a relational database, the selection of pre-defined character strings to be inserted into document template "holes". A second

5 method is described for inserting user-defined or concatenated character strings into selected document template "holes".

According to another aspect of the document generating system, a computer-based documentation system is

10 described in which the contents of a relational database are used to generate user-defined reports. The database described consists of a plurality of document templates, including option-text variables for use in filling the "holes" in each template, a plurality of variable records

15 for storing pre-defined character strings to replace the option-text variables in the document templates and a selection data file for storing pointers to the selected character strings. A system and method are described for controlling, via document processing means, the selection

20 of pre-defined character strings to be replace the option-text variables in a document template and for controlling, via document generating means, the generation of a document from pointers in the selection data file.

In addition, a branching function is described,

25 for use within the document processing means, in which selection of a first character string to replace a first

option-text variable in a document template will
automatically cause a branch to a second set of character
strings which can be used to replace a second option-text
variable. A character string selected from this second set
5   of character strings is then appended to the first string
and the resulting character string is used to replace the
first option-text variable. The method described permits
almost unlimited levels of branching.

<center>Brief Description of the Drawings</center>

Fig. 1 is a diagram showing one embodiment of the
document generation system.

Figs. 2a-2c illustrate data structures within
different embodiments of relational databases useful in a
15   document generation system according to the present
invention.

Figs. 3a-3b, 4a-4b and 5a-5b are tables
illustrative of some of the data structures used in
embodiments of three relational databases useful in a
20   document generation system according to the present
invention.

Fig. 6 is a table illustrative of an alternate
option-text data file useful in the embodiments shown in
Figs. 2a-2c.

25   Figs. 7a and 7b are general block diagrams of
embodiments of relational databases used in multi-user

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document generation systems according to the present invention.

Fig. 8 is a drawing depicting a preferred embodiment menu driven, graphical window environment.

Fig. 9 is a drawing representative of a screen display of a document template editing window for creating and editing a document template.

Fig. 10 is a drawing showing one embodiment of an option-text record editing window used for entering and editing character strings for use in replacing option-text variables, an example of an option-text list.

Fig. 11 is a drawing of a screen display of a patient variable selection window useful for selecting subject matter variable for use in a document template.

Fig. 12 is a drawing illustrative of a graphical approach to entering patient information.

Fig. 13 is a drawing illustrative of a screen display useful for associating user-entered character strings with an option-text variable.

Fig. 14 is a drawing illustrative of an alternate screen display useful for entering option-text note strings for use in an option-text variable.

Fig. 15 is a drawing showing a screen display for one embodiment of a method for combining several previously defined document templates to form a new document template.

Fig. 16 is a general block diagram illustrative of the formation of a document from data stored in a document template, patient data file, option-text file and selection data file.

Detailed Description of the Preferred Embodiments

In the following Detailed Description of the Preferred Embodiments, reference is made to the accompanying Drawings which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

Fig. 1 is a diagram of one embodiment of a document generation system. Document generation system 1 comprises a computing device 10, a relational database 2 and a multi-document word processor 6. In an alternate embodiment, document generation system 1 further comprises a graphics engine 4 which can be used to analyze data stored within relational database 2. In a second alternate embodiment, document generation system 1 further comprises a printer 8 for printing documents generated by system 1.

In the preferred embodiment, computing device 10 comprises an electronic display 14, a data processing

device 16, a keyboard 18 and an electronic storage device
20. Storage device 20 is a nonvolatile storage device used
for storing information within relational database 2.
Electronic storage device 20 can be any device capable of

5   storing data for long periods of time. For example,
electronic storage device 20 could be a floppy disk drive,
Bernoulli hard drive, Winchester hard disk, analog tape
drive, digital tape drive, optical disk drive. It will be
appreciated by those in the art that new or improved

10 electronic storage devices can be utilized by the present
invention as they become available for use.

       In an alternate embodiment, computing device 10
further comprises pointing device 12. In that embodiment,
pointing device 12 is used as an alternative input device

15 within document generation system 1. Pointing device 12
may comprise a mouse, trackball, light pen, bar-code
scanner or digitizing pad.

       Document generation system 1 automates the
documentation process by combining the editing power of

20 multi-document word processor 6 with the flexible storage
of relational database 2, preferably within a menu-driven,
graphic window environment. Documentation system 1
utilizes previously defined document templates composed of
"boiler-plate" text and information "holes" to manage

25 patient reporting and includes a user interface for use in

selecting phrases to be inserted into "holes" in the template.

Document templates can be created by the user to produce a variety of reports. The user will first design a
5 document. He or she will then assess the document to determine the text that will change from document to document and the text that will remain static across all documents. Static text becomes the boiler-plate of the document template; varying text is replaced by option-text
10 variables or "holes".

In the preferred menu-driven, graphic window environment of system 1, a document template is created and edited within a pop-up window. In that environment, a pop-up window appears for the document template to be created
15 and the user then enters the static text and "holes" necessary to define the document template.

In the preferred embodiment, static text is entered through keyboard 18; a "hole" or option-text variable is generated by selecting a special function key.
20 In that embodiment, at the "hole" location in the document template, the embodiment, at the "hole" location in the document template, the user depresses the special function key reserved for entering option-text variables. A option-text control menu then appears and the user selects the
25 "New" selection to create an option-text variable. Upon selection, an option-text editing pop-up window appears and

the user can enter phrases to be used to replace the option-text variable in the generated document. When all appropriate phrases are entered, the user exits the option-text pop-up window. Computing device 10 then saves an

5 option-text record containing the phrases entered and places a unique variable identifier associated with the option-text record in the document template at the hole location. The user then resumes entering text into the document template. When all text and variables have been

10 entered, the document template is complete and the user saves the template to nonvolatile memory. In the preferred embodiment, document templates are stored as ASCII files.

To use the document template, a user will select the type of report to be generated. The document template

15 associated with that report is retrieved from nonvolatile memory and computing device 10 begins to evaluate each "hole" in the template. Evaluation consists of scanning the document template for variable identifiers. When computing device 10 finds the first variable identifier in

20 the document template being evaluated, it lists the phrases contained in the option-text record associated with that variable identifier. The user then selects one or more of the phrases displayed, the selection(s) are recorded and computing device 10 moves to the next variable identifier.

25 When all variables have been evaluated, a document can be generated.

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In the preferred embodiment, variable identifiers are integer numbers surrounded by angle brackets (e.g. <101>). This format simplifies the variable search algorithm.

5   In the preferred embodiment of documentation system 1, a plurality of pre-defined document templates may also be provided. When the user wishes to generate a document from a pre-defined template, he or she calls up the document template for that document and fills in the

10   "holes" in the template. The text used to fill the "holes" is then saved to storage device 20 where it can be used to generate the desired document.

Relational databases are used advantageously to manage the document templates and the phrases used to

15   replace variables in the templates for documents generated within document generation system 1. A relational database comprises a series of data structures containing information linked through common fields. These structures are presented to the user as a collection of tables, each

20   with one or more columns and zero or more unique rows. Relational database 2 uses these structures to store, retrieve and manipulate character strings used to fill "holes" in the document template. These data structures are also used to store user responses captured during

25   document creation and to store relatively static information such as patient information. The preferred

embodiment of document generation system 1 is implemented

with a relational database implemented using a B-tree

model. Database manipulation is performed through program

calls to executable functions provided by a program called

5   B-Tree Filer 5.0 marketed by TurboPower Software of Scotts

Valley, California. B-Tree Filer 5.0 handles the mechanics

of storing, retrieving and indexing records and templates

in database 2. Those skilled in the art will recognize

that document generation system 1 could be implemented

10   through other data tree structures, or even through the use

of look-up tables, without departing from the scope of the

present invention.

One embodiment of a relational database 2 for use

in a document generation system 1 will be explained in

15   connection with Figs. 2A, 3A and 3B. Fig. 2A illustrates a

relational database 2 comprising one or more document

templates 22, an option-text file 24 and a selection data

file 26. Document template 22 comprises one or more text

strings 28 and one or more option-text variables 30.

20   Option-text variables 30 are the "holes" in document

template 22. A document is generated from document

template 22 by replacing each option-text variable 30 with

a character string 34.

One embodiment of option-text data file 24 is

25   illustrated in the table shown in Fig. 3A. Option-text

data file 24 comprises option-text data records 36 in which

are stored a plurality of character strings 34. Each record 36 corresponds to a specific option-text variable 30 in document template 22. Character strings 34 are strings formed from a unique option-text variable identifier 37 is used to associate a record 36 with its option-text variable 30. This permits the use of an option-text variable 30 in more than one document template 22. Each record 36 contains N cells 38 (in a typical system N=19); each cell can contain up to one character string 34. Character strings 34 are accessed via their cell address. They are not limited in length.

One embodiment of a selection data file 26 which can be used with database 2 of Fig. 2A is illustrated in the table shown in Fig. 3B. Selection data file 26 comprises a selection data record 40 associated with each option-text variable in document template 22. Each selection data record 40 is identified by a document identifier 42 and a variable identifier 37. Each record 40 stores a pointer 46 to a cell 38 of the option-text record 36 associated with the variable identifier 37. The pointers 46 provide access to character strings selected from option-text data records 36 during creation of a document.

In the preferred graphical environment, document generation system 1 is implemented as a menu-based document generation system which links each option-text variable 30

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in a document template 22 to its associated option-text

data record 36. In such an embodiment the plurality of

character strings 34 stored in record 36 are displayed for

user selection in the form of a menu. Each option-text

5   variable 30 in the document template 22 points at a

predetermined menu. During document processing, each

option-text variable 30 is evaluated. If a character

string associated with the variable 30 has not been yet

selected, system 1 displays the menu associated with the

10 variable 30. The user then selects one or more of the

character strings selected so that it can be used to

replace that particular variable 30 in the document. A

similar menuing system could be implemented on an

alphanumeric screen display.

15   The menuing approach offers some advantages in the

generating of a document. The user is given all available

choices and can select the appropriate choice using a

pointing device 12 during document processing. When a

document is generated, the one or more character strings 34

20 selected for each variable 30 in a document template 22

replace their respective variables 30.

The data structures defined in Figs. 2A, 3A and 3B

contain information sufficient to generate an individual

document for each document template.

25   A second embodiment of a relational database 2 for

use in a document generation system 1 will be explained in

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connection with Figs. 2B, 4A and 4B. Fig. 2B illustrates a
relational database 2 comprising one or more document
templates 48, an option-text data file 24, a patient data
file 150 and a selection data file 152. Document template

5   48 comprises one or more text strings 28, one or more
option-text variables 30 and one or more subject matter
variables 154. A document 156 (shown in Fig. 16) is
generated from document template 48 by replacing each
option-text variable 30 with a character string from

10   option-text data file 24 and replacing each subject matter
variable 154 with a character string 158 from patient data
file 150.

In one embodiment of the document generation
system 1 of Fig. 2B, option-text data file 24 is structured

15   as in Fig. 4A. In that embodiment, a separate patient data
file 150 is created. That patient data file 150 is
illustrated in the table shown in Fig. 4A. Patient data
file 150 comprises patient data records 160 in which are
stored a plurality of character strings 158. Each record

20   160 corresponds to a specific subject matter variable 154
in document template 48. A unique subject matter variable
identifier 162 is used to associate a record 160 with its
subject matter variable 154. This permits the use of a
subject matter variable 154 in more than one document

25   template 48. As in option-text data file 24, character

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strings 158 of patient data records 160 are accessed via their cell address.

One embodiment of a selection data file 152 which can be used with database 2 of Fig. 2B is illustrated in the table shown in Fig. 4B. Selection data file 152 comprises a selection data record 40 associated with each subject matter variable 154 in document template 48. Each selection data record 164 is identified by a document identifier 166, a variable identifier 163 and a subject matter identifier 162. Each record 164 stores a selection indicator 170 which points to either a cell within either option-text data record 36 or patient data record 160, depending of the type of variable. Variable identifier 163 may point either to an option-text data record 36 (OVT[x]) or to a patient data record 160 (PV[y]) depending on the type of variable being replaced.

Patient data file 150 contains information about specific patients. The patient data information may include specific information about a particular patient such as name, address, etc. Patient data records 160 provide a mechanism for storing patient information in a central location accessible to different document templates 48 and even to different users. It should be obvious that a data structure similar to patient data file 150 can be implemented for any subject matter which would benefit from a central storage approach.

The data structures of Figs. 2B, 4A and 4B contain

information sufficient to generate individual documents

identified by patient and document type.   In an alternate

embodiment, documents generated from the same document

5   template 48 for the same patient or subject matter can be

differentiated by adding a date entry to the selection data

records 64 in selection data file 52.

A third embodiment of a relational database 2 for

use in a document generation system 1 will be explained in

10   connection with Figs. 2C, 5A and 5B.   Fig. 2C illustrates a

relational database 2 comprising one or more document

templates 48, an option-text data file 24, a patient data

file 150, an option-text note data file 180, a report log

182, a date stamp function 184 and a selection data file

15   186.   The embodiment shown in Fig. 2c adds two additional

data structures (option-text note data file 180 and report

log 182) to those structures defined in Fig. 2b.   In

addition, Fig. 2c adds a date stamp function 184 that

permits the identification of records by date and time.

20   In one embodiment of the document generation

system 1 of Fig. 2C, option-text data file 24 is structured

as in Fig. 3A and patient data file 150 is structured as in

Fig. 4A.   In that embodiment, a separate option-text note

data file 180 and a separate report log 182 are created.

25   In one embodiment (not shown), option-text note

data file 180 comprises option-text note data records 191

in which are stored a single user-defined text note character string. Each record 191 corresponds to a specific option-text variable 30, a specific patient, a specific document template 48 and a specific date. To do

5   this, each option-text note data record comprises an option-text variable identifier 37, a subject matter identifier 162, a document identifier 166 and a text note date entry 195.

        The means for forming an option-text note must be

10   part of option-text record 36. In the preferred embodiment, a special option-text note option function is placed in one of the cells 38 of record 36. During document processing, option function is displayed along with the other entries of record 36. When function is

15   selected, a window opens for free text entry of the option-text note.

        In the above embodiment, option-text note processing can be designed such that, when a user chooses to enter an option-text note character string, a screen is

20   displayed so that string can be entered by the user. The length of the character string entered is then measured. If the length of the option-text note character string is below a threshold, the string is stored directly in selection data file 186. If the length of the string is at

25   or above the threshold, the string is stored in option-text note data record 191.

One embodiment of a report log 182 is illustrated in the table shown in Fig. 5a. Report log 182 comprises one or more report log records 198 in which are stored a record of the date a report was created and the patient for whom the report was created. Each report log record comprises a document identifier 166, a patient identifier 162 and a date entry 196. Report logs permit the user to maintain reports for the same patient generated from the same template.

One embodiment of a selection data file 186 which can be used with database 2 of Fig. 2C is illustrated in the table shown in Fig. 5B. Selection data file 186 comprises a selection data record 192 associated with each subject matter variable 154 in document template 48. Each selection data record 192 is identified by a document identifier 166, a variable identifier 163, a subject matter identifier 162 and a date entry 196. Each record 192 stores a selection indicator 194 which points to either a cell 38 of the option-text data record 36 associated with variable identifier 163 or a cell 161 of the patient data record 160 associated with the variable identifier 163 and subject matter identifier 168. Variable identifier 163 may point either to an option-text data record 36 (OVT[x]) or to a patient data record 160 (PV[y]) depending on the type of variable being replaced.

The data structures of Fig. 2c contain information sufficient to generate individual documents identified by patient, document type and the date the document was created.

5　　　　An alternate embodiment of the option-text data file 24 shown in Figs. 2a-2c is described in connection with the tabular illustration of an option-text data file 200 shown in Fig. 6. Option-text data file 200 adds a branching function to data file 24. Option-text data file 10 200 comprises option-text data records 202 in which are stored a plurality of character strings 34. Each record 202 corresponds to a specific option-text variable 30 in document template 22 or 48. A unique option-text variable identifier 204 is used to link a record 202 with its 15 associated option-text variable 30. This permits the use of an option-text variable 30 in more than one document template 22 or 48.

In the embodiment shown in Fig. 6, each record 202 comprises N string cells 205 (in a typical system N=19) and 20 N branching option cells 206. Each string cell 205 can contain up to one character string 34 and, like the embodiment shown in Fig. 3a, character strings 34 are accessed via their cell address and are not limited in length. In addition, each string cell is associated with a 25 separate branching cell (in the example shown in Fig. 6,

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B[1] is the branching cell for S[1], B[2] is the branching

cell for S[2], and so on).

In operation, (looking at Fig. 6) when a document

creator wishes to offer a branch on a particular character

5 string 34, he or she edits option-text data record 202 and

associates that character string 34 with a second option-

text identifier 204. (For example, to associate an

identifier 204 with a character string stored in cell S[2],

store identifier 204 in cell B[2].) When a user processes

10 a document template containing the option-text variable 30

associated with that record 202, data processing device 16

displays the character strings S[1-N] contained in record

202. If the user selects the character string stored in

S[2], the system branches so that the variable 30

15 associated with the second option-text identifier 204 can

be evaluated. The character string selected during the

second variable evaluation is then appended to the

branching character string. In the previous example, the

selected character string would be appended to the

20 character string stored in S[2].

In yet another embodiment, a multi-user system

partitions relational database 2 into a plurality of parts.

Typical databases 2' for a multi-user system are shown

generally in Figs. 7a and 7b. The embodiments shown in

25 Figs 7a and 7b are described in connection with selected

data structures of Fig. 2c.

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Relational database 2' comprises user-specific document templates 48, option-text data records 36 and selection data records 192. In the example given in Fig. 7a, information in patient data file 150 is stored such

5   that more than one user can access patient information. In addition, a date stamp function 184 may be placed such that it is accessible to many users. In such an embodiment, each user may have access to the shared information in patient data file 150 for use in generating user-specific

10   documents 210 and may define specific document templates 48 incorporating available data in a manner which seems appropriate for the particular document 210 desired. For instance, such a multi-user system might be used in a hospital or clinic wherein a variety of different types of

15   physicians are using document generation system 1. An orthopedic surgeon and a gynecologist probably would not want to have the same document template 48 for describing an office visit; however, both physicians may need to incorporate specific patient data including name, age,

20   address, date of birth and insurance provider into a particular report document. Significant cost savings and efficiency can be achieved by sharing this information between various individuals utilizing document generation system 1. At the same time, it is typically necessary to

25   provide flexibility within the document generation system 1 to allow custom documents or reports to be generated for a

particular situation. As a result, relational database 2'

preferably is partitioned into user-specific data and

sharable data. Such a configuration can be utilized across

a local area network comprising a plurality of computing

5   devices 10 connected to a relational database 2' which has

user-specific and sharable portions of data.

In an alternate embodiment of a multi-user

relational database 2', as is illustrated generally in Fig.

7b, sharable data coverage has been expanded to include

10 option-text data file 24' and document templates 48'. Such

a system would permit flexible sharing of document

templates 48' and their associated option-text data records

36'.

In yet another alternate embodiment of multi-user

15 relational database 2' (not shown), a system could be

constructed in which each user has a private option-text

file and a private document template file. Each user would

also have access to a public option-text file and a public

document template file. Such a system would provide a

20 balance between access to user-specific document templates

and templates for generating general usage documents.

The computing device 10, in combination with the

multi-document word processor 6 and relational database 2,

provides a user interface for utilizing the document

25 templates 22 and 48 to generate a document. The multi-

document word processor 6 provides an editing environment

for making user modifications to the text strings 28, to the character strings 34 of option-text data records 36 and to the character strings 158 of patient data records 160. Interaction of the electronic display 14, data processing

5 device 16 and keyboard 18 provide a selecting function for selecting at least one character string 34 from the plurality of character strings 34 associated with a particular option-text variable 30. This selecting function may be accomplished by depressing key actuators on

10 keyboard 18. In an alternative embodiment, movement of a pointing device 12 in combination with electronic display 14 accomplish the selecting function. Similar interaction provides a selecting function for selecting at least one character string 158 from the plurality of character

15 strings 158 associated with a subject matter variable 154.

The elements of the user interface further combine to provide a document generation function which generates a document in which variables 30 and 154 are replaced by character strings obtained from pointer information stored

20 in selection data records 40, 164 or 192.

Security access to stored data preferably is provided by the document generation system 1. Security access may be provided by distinguishing between each user's data and reports through the use of a user name. In

25 the preferred embodiment, the user name is comprised of the first and last name of a user followed by an optional

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security password. The first and last name are combined to
form a pointer to a storage location within relational
database 2 which can typically be accessed by a user only
after entering his or her first and last name as well as a
5   security password.

The preferred embodiment document generation
system 1 further includes a contextual help function in
which operating instructions for use of the document
generation system 1 can be displayed on electronic display
10   14 or printed to printer device 8.

Fig. 8 is a drawing depicting a preferred
embodiment menu-driven, graphical windowing environment.
This windowing environment of document generation system 1
supports both text and graphics operation modes. A user
15   can choose between the two different modes of operation.
In either mode of operation, the appearance and
functionality of the document generation system remains
substantially consistent. The only limitation is that the
use of an alternative embodiment graphics engine typically
20   is not available in text mode operation.

The preferred graphics window environment 50 is
divided into three areas. The areas include a top window
section 52 which preferably displays the date, time,
product name and main menu selections. Top window section
25   50 includes pop-up windows 53 which appear when one of the
main menu selections is activated. Pop-up window 53

includes a listing of the sub-menu selections 51 associated with the activated main menu selection.

Window environment 50 further includes a middle window section 54 where documents, graphics and dialogue

5 windows can be displayed and manipulated. The graphics window environment 50 further includes a bottom window section 56 which displays status information for such things as the word processor 6, a generated report, particular selections of report and patients, and keyboard

10 choices.

The operation of document generation system 1 will be explained using the data structures described in connection with the multi-user system shown in Fig. 7a.

One of the first steps in using the document

15 generation system 1 is to create a document template 48. One embodiment of a template editing window 58 for creating and editing a user-modifiable document template 48 is shown in Fig. 9. User-modifiable document template 48 comprises one or more option-text variables 30 embedded in text. (In

20 the embodiment shown, option-text variable identifiers 37 are integers starting at 101. A unique integer is associated with each variable 30 employed by a user.)

In the preferred embodiment document generation system 1, a plurality of different documents 156, or

25 reports, can be generated for different needs. For example, a physician will probably create a separate report

for initial visits and for follow-up visits by a particular patient as well as a separate report for writing a prescription.

During the process of creating a document template
5 48, a user typically defines the contents of option-text data records 36 associated with each option-text variable used. Fig. 10 is a drawing showing one embodiment of an option-text record editing window 60 used for entering and editing character strings 34 in a data record 36. In the
10 embodiment shown in Fig. 10, window 60 displays the contents of the option-text data record 36 being edited. A user can add, delete or modify character strings 34 within option-text record 36 through the use of word processor 6. (In the example shown in Fig. 10, character strings 62 or
15 64 may be selected by the user during document processing in order to insert the selected string into document template 48.) By selecting different character strings 34 within record 36, a user can customize a particular report for a particular patient corresponding to a particular
20 office visit. For example, document template 48 can be combined with the selection of character string 62 to form a document stating "patient came in complaining of fatigue, ...".

In the preferred embodiment, the user interface
25 provides combination operators which can be used to select more than one character string 34 from within an option-

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text data record 36. For example, if the user selects combination operator 66, the user interface will prompt the user to select two character strings 34. The selected character strings 34 will then be combined to replace the

5 variable 30 associated with record 36 when a document is generated. In the example shown in Fig. 10, the selection of combination operator 66 followed by the selection of strings 62 and 64 would cause system 1 to replace the associated variable 30 with the phrase "fatigue and loss of

10 appetite".

Another typical step in utilizing the document generation system 1 is the entering of patient data into patient data records 160 of a patient data file 150. Fig. 11 is a drawing showing one embodiment of a patient

15 variable selection window 68 useful for selecting subject matter variables 154 to be used in a document template 48. Each subject matter variable 154 is associated with a patient data record 160 of patient data file 150.

In the preferred embodiment, patient information

20 stored in data file 150 can be utilized by a plurality of users through the selection of particular subject matter variables 154 within window 68. Variables 154 selected are inserted into document template 48 at the point where the call to the window 68 function was initiated.

25 In one embodiment of the present document generation invention, patient specific information is

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entered into a patient data entry window 70 as shown in
Fig. 12. By using patient data entry window 70, the user
interface typically will prompt the user for various
patient specific information such as last name, first name,
5 middle initial, home phone and health insurance company ID
number. After a user enters this information into window
70, each piece of patient information can be stored in
relational database 2 in the appropriate patient data
record 160. Subsequently, such information can be
10 retrieved by all users for use in generating a document
156.

After creating suitable document templates 48 and
entering patient information into patient data records 160,
a user can generate a set of selection data records 186
15 which can be stored in selection data file 186. To create
a particular set of selection data records 192, a user will
first select a particular patient for which a report is to
be generated. Shown in Fig. 8 is a preferred embodiment
menu from which to choose the option of specifying a
20 particular patient. A user may select the "choose patient
from list" selection 51 from the sub-menu selections 51
displayed in pop-up window 53. As a result of such a
selection, preferred computer device 10 will display
another menu from which to choose a particular patient for
25 generating a report. After the user selects a particular
patient from the menu, the user typically will select a

"single report" selection 51 within pop-up window 53 in order to designate a particular report document which is to be generated for this particular patient. Upon selecting "single report", a window including a menu of possible

5 document templates 48 which can be used to generate a document will be shown. A user will then typically select the particular document template 48 which is to be used in conjunction with the selected patient. Subsequently, the selected document template 48 will be shown on electronic

10 display 14 for review by user. Data processor 16 preferably will prompt the user to select particular character strings 34 within the option-text data records 36 associated with option-text variables found in the selected document template 48. An example of such a document

15 template 48 is shown in Fig. 9, and an associated example option-text data record 36 is shown within option-text record editing window 60 of Fig. 10. Data processor 16 typically will prompt the user to select one of the character strings 62 or 64 displayed in window 60 before

20 allowing the user to generate a report.

Fig. 13 is a drawing showing one embodiment of an option-text record selection window 74 used for selecting one of the plurality of entries in an option-text record 36. In the example shown in Fig. 13, option-text record 36

25 comprises two special function entries 69 and 71. When a user selects special function entry 69 from window 74,

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system 1 automatically replaces the variable 30 associated
with record 36 with the current date. When a user selects
special function entry 71, system 1 automatically generates
a text entry window 73 that can be used to enter a single

5   line of data of up to 27 characters. That line of data is
then stored in the selection indicator section of the
selection data record 192 associated with record 36 for
subsequent use in generating a document derived from the
selection data record 192.

10   In another embodiment (not shown), entry 71 is
replaced with an option-text note option function as
described previously. When a user selects option-text note
option function, system 1 automatically generates a text
note entry window 73' as shown in Fig. 14 that can be used

15 to enter up to six full pages of text. That text is then
stored in option-text note data file 180 as described in
the discussion accompanying Figs. 2C, 5A and 5B. Option-
text notes are useful. They provide a mechanism for the
user to customize a report for a particular situation when,

20 for example, the character strings 34 provided with data
record 36 are not appropriate for a particular situation or
when a user desires to add additional information into the
report at that particular point.

      After a user has selected replacement strings for

25 all of the option-text variables 30 within a document
template 48, he or she can electronically store the

resulting selection data records 192 in electronic storage device 20.

In addition, a user may choose to generate a document 156. Shown in Fig. 16 is a diagram showing a preferred embodiment procedure for generating a document in a system similar to that shown in Fig. 2b. A typical generated document 156 is derived from a data structure 48 in combination with option-text data file 24, selection data file 152 and patient data file 150. Data preferably is inserted into data structure 48 at the points occupied by option-text variables 30 and subject matter variables 154. In particular, option-text variables 30 are replaced with character strings from the appropriate option-text data record 36 or, if appropriate, from the option-text note associated with record 36. Subject matter variables 154 are replaced with character strings obtained from the appropriate patient data record.

After generating a document 156, document generation system 1 can display a generated document on the electronic display 14 of computing device 10 and/or output the generated document to printer 8.

Fig. 15 is a drawing showing an alternative preferred embodiment example of selecting several previously defined document templates 48 to form a new document template 72. It may be desirable to generate a complete patient report including several separate reports.

For instance, a complete patient report document might
include a report document template 48 for "an initial
visit," "lab results," and "follow-up" for ease of data
entry and subsequent document generation these separate

5   document templates 48 may be combined into a single
document template 72. As a result, a plurality of
different multiple document template definitions 72 may be
generated for specific needs. Shown in Fig. 15, multiple
document template definitions 72 normally will include

10   several document template definitions 48. A user can
define the order in which each document template 48 will
appear in multiple document template definition 72. After
a user has selected each of these desired document
templates 22 in a particular order, a multiple document

15   template definition 72 preferably can be stored on
electronic storage device 20. Subsequently, multiple
document storage definition 72 is typically selected by a
user for use with a particular patient in a similar manner
as was used to select a document template 48.

20   In an alternative embodiment, document generation
system 1 can generate a checklist document including
indicia of character strings 34 to be chosen within an
option-text data record 36 for a particular document
template 48. A printed copy of the checklist document can

25   be utilized by a user to indicate preferred character
strings 34 to be included in a generated document for a

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particular patient at a particular time. For example, a
user might use a medical check-up checklist document to
select or indicate particular information on an office
visit by a patient. Such information might include

5   measured weight of the patient during the office visit, new
height or weight, symptoms of illness shown by the patient,
diagnosis of an illness, and prescribed treatment of the
illness. Subsequently, the same or a different user of the
documentation generation system may enter the information

10   indicated on the check sheet document to generate a report
on the office visit by the patient.

As stated earlier, in one alternate embodiment,
the document generation system 1 shown in Fig. 1 further
comprises graphics engine 4. The graphics engine 4 is an

15   option preferably provided within the document generation
system 1 which allows visual analysis of data stored within
the relational database 2, including analysis of selection
data records 40, 164 or 192 and patient data records 160.
Data is displayed on electronic display 14 in various forms

20   within windows on the screen. The forms may include the
following graph types:

-    3-D Bar

-    Line

-    Area Fill

25   -   Pie

-    Histogram

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The graphics engine 4 allows a user to manipulate a graph in a wide variety of ways. Each data item has its own graphics definition, thereby allowing a mixture of graph types to be displayed simultaneously on the same

5   graph. For example, a graph could contain a line of data overlaying a series of 3-D bars.

Preferred computer device 10 further includes a graphics editing mode of operation in which almost every aspect of a graph can be modified by user, including graph

10   type, color, style, hatching, exploded pie pieces, x-axis and y-axis value ranges as well as number of points. In such an embodiment, the definition of the graph typically is stored by the electronic storage device 20 as an option-graphic image definition.

15   Preferred document template 48 further comprises an option-graphic variable for electronically storing a plurality of user-definable option-graphic image definitions. Such a computer device 10 typically further includes a selection function for selecting an option-

20   graphic image definition within an option-graphic record associated with the option-graphic field. Subsequently, a document may be generated comprising the selected option-graphic image definition.

The document generation system 1 further

25   preferably includes an analysis mode of operation in which data processor 16 can analyze electronically stored indicia

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of documents to produce graphs, tables or patient billing reports. Such analysis may include analysis of types of procedures performed and the results obtained. Analysis programs can sort on the selection indicators in selection

5   data records to produce charts comparing the type of procedure and its result to other procedures. In addition, practice trends can be easily analyzed.

In another embodiment, patient billing reports may be based upon selections made within option-text records 36

10   within one or more document templates 48 related to a particular patient. For example, a bill could be generated for an office visit by analyzing the time spent with the patient indicated by a selection within an option-text field as well as the diagnosis made and the treatment

15   prescribed. In addition, a brief description of the services provided could be incorporated into the billing document by deriving particular information from the electronic analysis of the selection data corresponding to a particular patient.

20   ~~Appendix A contains an object code listing of two MSDOS files that make up a preferred embodiment of the present system.~~

Although the present invention has been described and illustrated with a certain degree of particularity, it

25   is understood that the present disclosure of embodiments has been made by way of example only and that numerous

changes in the arrangement and combination of parts as well
as steps may be resorted to by those skilled in the art
without departing from the spirit and scope of the present
invention as claimed. For example, the document generation

5   system could be utilized by other professionals such as
attorney's, accountants, psychologists, dentists and
consultants. Each of these professionals may find
significant cost savings and increased efficiency by
utilizing a document generation system similar to the

10   previously described preferred embodiments.

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